EDITORIAL

Predicting future cardiovascular risk from blood pressure response to dynamic exercise: a neglected risk factor?

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by Perçuku et al, see p. 855

In both healthy people and patients with hypertension, any form of exercise, both dynamic and static, will cause an increase in systolic blood pressure (BP) during exercise, while maintaining or slightly reducing diastolic BP.

Blood pressure response to physical exertion is an important diagnostic parameter assessed during submaximal exercise upon stress tests performed for diagnostic purposes, mainly when coronary artery disease is suspected. During dynamic isotonic exercise, we expect an increase in systolic BP in line with increasing exercise load. In healthy people, systolic pressure increases during dynamic exercises and stabilizes after 2 to 3 minutes of exercise at the same intensity level. Diastolic pressure under conditions of increasing exercise load usually remains unchanged or may decrease slightly.[1]

Current guidelines of scientific societies provide criteria for excessive pressure response, as well as criteria for the termination of exercise test associated with excessive increase in BP.[2] An expert opinion of the Polish Cardiac Society Working Group on Cardiac Rehabilitation and Exercise Physiology defines excessive increase in BP in response to exercise testing as a systolic BP higher than 210 mm Hg in men or higher than 190 mm Hg in women.[3] The same scientific position statement recommends discontinuing the exercise test in the event of an excessive hypertensive reaction with a systolic BP exceeding 250 mm Hg or a diastolic BP exceeding 115 mm Hg.

The first study linking exaggerated systolic pressure response to cardiovascular outcome in apparently healthy men was published in 2002 by Filipovský et al.[4] Over 17 years of follow-up in the Prospective Paris Study, both cardiovascular and total mortality was associated with the systolic BP increase during bicycle ergometry.[4] This research question was later raised in a number of studies, including the Framingham Heart Study, the oldest study on cardiovascular risk factors.[5] Framingham investigators examined 3045 subjects, including 53% of women, whose BP was measured at rest and during treadmill exercise test. In contrast to findings from the Paris group, after adjustment for BP at rest and other conventional cardiovascular risk factors, exercise diastolic BP, but not exercise systolic BP, remained a significant predictor of incident cardiovascular disease.[6] Thus, the relationship between exercise BP and cardiovascular outcomes has remained undetermined.

The current systematic review and meta-analysis published by Perçuku et al[7] represents an important contribution to the continuing discussion on the issue. The authors identified 8 studies including a total of 47 188 individuals, with a median follow-up of 19.3 years. Higher systolic hypertensive response to exercise was associated with a 36% higher risk of composite endpoint, combining cardiovascular mortality and coronary artery disease, as well as with a 53% higher risk of developing coronary events and a 29% higher risk of cardiovascular mortality.[7]

In long-term prospective studies, increased BP response to exercise has been also linked to increased incidence of hypertension. Blood pressure on exercise testing in 2410 participants from the Framingham Study, normotensive at baseline, was related to the incidence of hypertension during an 8-year follow-up. An exaggerated diastolic BP response to exercise was predictive of the risk for new-onset hypertension in normotensive men and women. An elevated recovery systolic BP was predictive of hypertension in men.[8] These findings may suggest that exercise testing unmasks borderline hypertension in subjects predisposed to development of hypertension. Moreover, in patients with a marked hypertensive response to exercise, left ventricular

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diastolic dysfunction was observed, contributing to exercise intolerance, even in the absence of resting hypertension.[9] Thus, exaggerated BP response to exercise is related also to target organ lesions, typically found in hypertensive patients.

A group of Greek researchers analyzed whether it is possible to unmask hypertension by analyzing BP parameters during exercise. The study included 86 people without prior medical history or drug treatment. Based on the office BP measurement and 24-hour BP recording, the study group was divided into subjects with normal BP values, patients with masked hypertension (ie, normotension on office and hypertension on ambulatory measurements), and patients with sustained hypertension. The impact of repeated isometric physical effort assembled with a handgrip test on BP was assessed. Although no differences were observed in baseline BP between the masked-hypertension group and normotensive persons, after 1 minute of exercise, a significantly higher increase in systolic and diastolic BP was observed in the group with masked hypertension, as compared with normotensive individuals. The increase in systolic BP of patients with masked hypertension was comparable to that in patients with sustained hypertension.[10] The excessive increase in exercise BP observed in patients with masked hypertension can facilitate the diagnosis of this particular condition. Masked hypertension is found even in 15% of people with normal office BP, and its incidence is higher in younger patients, men, smokers, individuals with excessive alcohol consimption, and those who are more physically active. Exposure to stress (including stress at work) and anxiety disorders are other factors that influence the incidence of hypertension outside the doctor's office. The prognosis and risk of cardiovascular events in people with masked hypertension is comparable to those in patients with sustained hypertension.[11]

In summary, internal medicine specialists should focus their attention on BP values at peak exercise during exercise testing and, in the case of exaggerated response, consider diagnostic workup of masked hypertension, as masked or sustained hypertension seems to mediate increased cardiovascular risk in these individuals. Obesity, diabetes, and chronic kidney disease often coexist with masked hypertension. Importantly, many people with masked hypertension on office measurements present with BP in the high-normal category (130–139/85–89 mm Hg). Therefore, in this group, out-of-office BP measurements should be particularly advised (home or 24-hour ambulatory monitoring), together with the assessment of other cardiovascular risk factors, recommendation of lifestyle changes,[12] and consideration of pharmacotherapy. Moreover, one should keep in mind that advising our patients on starting or continuing regular physical activity provides them with a powerful tool to prevent cardiovascular morbidity and mortality.

ARTICLE INFORMATION

DISCLAIMER The opinions expressed by the author are not necessarily those of the journal editors, Polish Society of Internal Medicine, or publisher.

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